

### **Abstract of the Invention**

The invention provides a system and process for depositing films, wherein an acoustic microbalance is used for process monitoring and/or control. The acoustic microbalance is placed in a deposition chamber and may optionally be mounted on a semiconductor substrate, such as a silicon wafer, on which a film is being deposited. Data from the acoustic microbalance is employed to detect a process endpoint, determine an adjustment to process conditions for a subsequent batch, and/or provide feedback control over current process conditions. One aspect of the invention involves the application of a model or database to correct for differences between the extent of deposition on an acoustic microbalance cantilever and the extent of deposition on a substrate being processed. Another aspect of the invention takes a probabilistic approach to employing acoustic microbalance data. The acoustic microbalance data is employed, optionally together with other process data, as evidence in a probabilistic dependancy model that infers the process state and/or predicts a process outcome.